THE GENUS *PACKERA* (ASTERACEAE: SENECIONEAE) IN COLORADO, U.S.A.

Debra K. Trock[1]

Botanical Research Institute of Texas
509 Pecan Street
Fort Worth, TX 76102-4060, U.S.A

ABSTRACT

Fourteen species of *Packera* are known to occur in Colorado. Recently published floras for the state have treated these species variously as *Packera*, *Senecio* and *Ligularia*. While preparing a treatment of this genus for the Flora of North America Project, the author discovered some confusion among the local botanists who rely on those floras for identifications of this difficult group. This paper presents descriptions for each of the species that occur in the state, comments on how to differentiate them in the field, and identification keys.

RESUMEN

Se conocen catorce especies de *Packera* en Colorado. Las floras del estado publicadas recientemente han tratado estas especies de modo diferente como *Packera*, *Senecio* y *Ligularia*. Mientras preparaba un tratamiento de este género para la Flora de Norte América, el autor encontró confusión entre los botánicos locales que usan estas floras para las identificaciones de este grupo difícil. Este artículo presenta descripciones de las especies que viven en el estado, comentarios sobre como diferenciarlas en el campo, y claves de identificación.

INTRODUCTION

What Distinguishes a *Packera* from a *Senecio*?

Traditionally, species now included in *Packera* were relegated to the genus *Senecio*, a large genus of over 3,000 species. In the early 1800s DeCandolle (1838) provided a worldwide treatment of *Senecio*. He recognized 16 informal groups, based largely on geographic distribution. Greenman (1915, 1916, 1917, 1918) and Rydberg (1900) had varying definitions and numbers of informal "species groups." Through the 1960s into the 1980s Barkley (1962, 1968a, 1968b, 1978, 1980) published several papers on three of these informal groups, the *Aurei*, the *Lobati* and the *Tomentosi*, which he collectively referred to as the "Aureoid Senecios."

Within *Senecio* s.l., most of the taxa have a base chromosome number of x=10 or derivatives thereof. However, Löve and Löve (1976) pointed out that there was a group of anomalous species whose chromosomal base number was either x=22 or x=23 and had a suite of unique morphological characters. Furthermore those taxa corresponded to three New World groups informally recognized by Barkley: the *Aurei*, the *Lobati*, and the *Tomentosi*. They proposed that these species be placed in a new genus, *Packera*, based primarily on gross morphology and chromosome number.

[1]Current address: Michigan State University, 166 Plant Biology, East Lansing, MI 48824-1312, U.S.A.

The recognition of *Packera* was not immediately accepted and still is not recognized by some workers. However, support for recognizing *Packera* has grown over the past 25 years. Molecular, palynological, and cytological data, while doing little to help clarify relationships between species in this group, have all lent support for recognizing the genus *Packera*. These types of data are acquired by laboratory work, but how does a botanist in the field decide if he/she is looking at a *Packera* or a *Senecio*? Table 1 provides a comparison of characters that are useful for field or herbarium identifications. Often a combination of these features will be needed to make a determination.

MATERIALS AND METHODS

While preparing a treatment of the genus *Packera* for the *Flora of North America* project, I borrowed specimens from many regional herbaria, and visited several others to obtain both accurate distribution records, and a good understanding of the morphological variation that is characteristic of these species. I have also made four collecting trips through the central part of Colorado, where the diversity of *Packera* is the highest. During the course of that work it became apparent that there was confusion among local botanists concerning which characters provide for accurate identification, and about which species belong in the genus *Packera*, and which are still treated as *Senecio* s.l.

I have examined over 1100 Colorado specimens from the following herbaria: Adams State College (ALAM); Botanical Research Institute of Texas (BRIT); Brigham Young University (BRY); Canadian Museum of Nature (CAN); Colorado College (COCO); Colorado State University (CS); Kansas State University (KSC); Miami University (MU); Missouri Botanical Garden (MO); Montana State University (MONT); New York Botanical Garden (NY); North Dakota State University (NDA); Northeast Louisiana University (NLU); Oregon State University (OSC); Rancho Santa Ana Botanic Garden (RSA); Rocky Mountain Herbarium (RM); University of Alaska Museum (ALA); University of British Columbia (UBC); University of California (UC); University of Colorado (COLO); University of Kansas (KANU); University of New Mexico (UNM); University of Southern Colorado (PUSC); University of Washington (WTU); and Vanderbilt University (VDB).

The goal of this paper is to provide descriptions, keys, common synonyms, and a discussion of the most useful morphological characters to assist botanists in their efforts to accurately identify species in this genus. Dot maps providing distribution information for each species are presented in Figures 1, 2 and 3.

Generic characters of Colorado *Packera* species

All taxa of *Packera* are exclusively herbaceous, and most are perennials. Three of the Colorado species, *P. multilobata*, *P. plattensis*, and *P. neomexicana* can also

TABLE 1. Comparison of characters useful for field or herbarium identifications of *Packera* and *Senecio*.

Packera	Senecio	Informal Groups of Barkley within *Senecio*
Leaves progressively reduced distally	Leaves concentrated distally, or equally distributed along the stem	*Suffruticosi*
Heads erect on peduncles	Heads nodding	*Amplectentes*
Phyllaries occasionally with reddish tips. Rarely black-tipped, and if so, middle cauline leaves NOT clasping	Phyllaries with prominent black tips, AND middle cauline leaves clasping	*Amplectentes*
Caudices taprooted or rhizomatous, with branching fibrous lateral roots	Caudices button-like or lateral rhizomes, with fibrous roots unbranched and fleshy	*Lugentes, Boreali, Integerrimi*

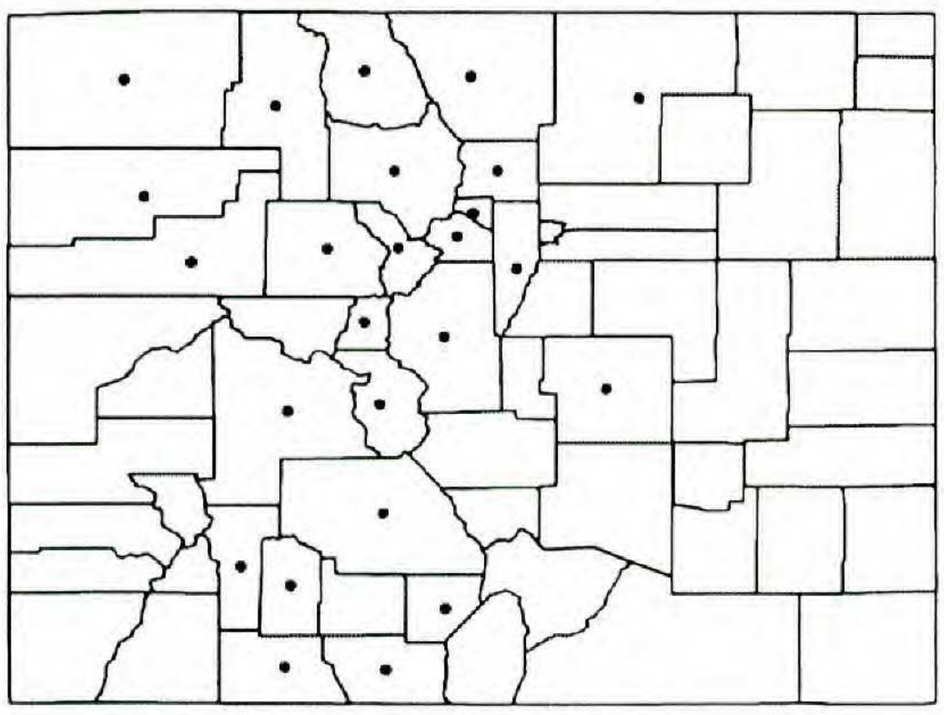
be biennials, and *P. neomexicana* may occasionally be a winter annual. Stems of all Packeras consistently grow from either a single or a cluster of basal rosettes.

The perennating structure is a woody caudex or a shortened rhizome. A caudex is the persistent base of an herbaceous stem that normally arises from a taproot. In some species the caudex is short, thin, and weak, while in others it can become elongated, branching, stout, and woody. Species that inhabit steep rocky slopes have creeping rhizomatous caudices. Taxa growing in wet meadows or other mesic environments frequently have abundant fibrous roots, which may almost completely disguise the presence of the caudex.

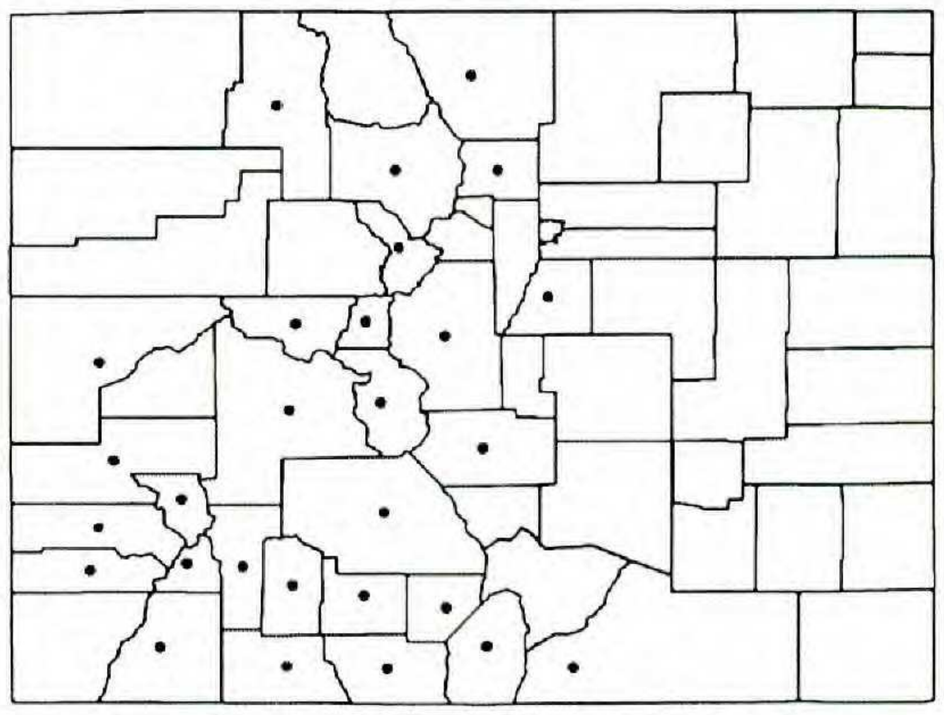
Stems are normally single from the caudex or taproot. However, because in many species the caudex is more or less branching, it may appear that there are several stems clustered together, but usually no more than four or five. Some species may have stems that display anthocyanic (reddish) pigments. *P. multilobata*, growing in open sagebrush habitats, and *P. porteri*, growing on talus slopes both exhibit this characteristic.

There is considerable variation in the amount of pubescence along the stems. In Colorado, *P. cana*, *P. fendleri*, and *P. werneriifolia* are nearly always densely tomentose. Other species vary widely in the amount and persistence of tomentum. Almost all Packeras have at least some pubescence restricted to the base of the stem and to the axils of the leaves when young. Although the presence or absence and location of pubescence is commonly used in keys and descriptions, it should only be used in conjunction with other characters when identifying specimens.

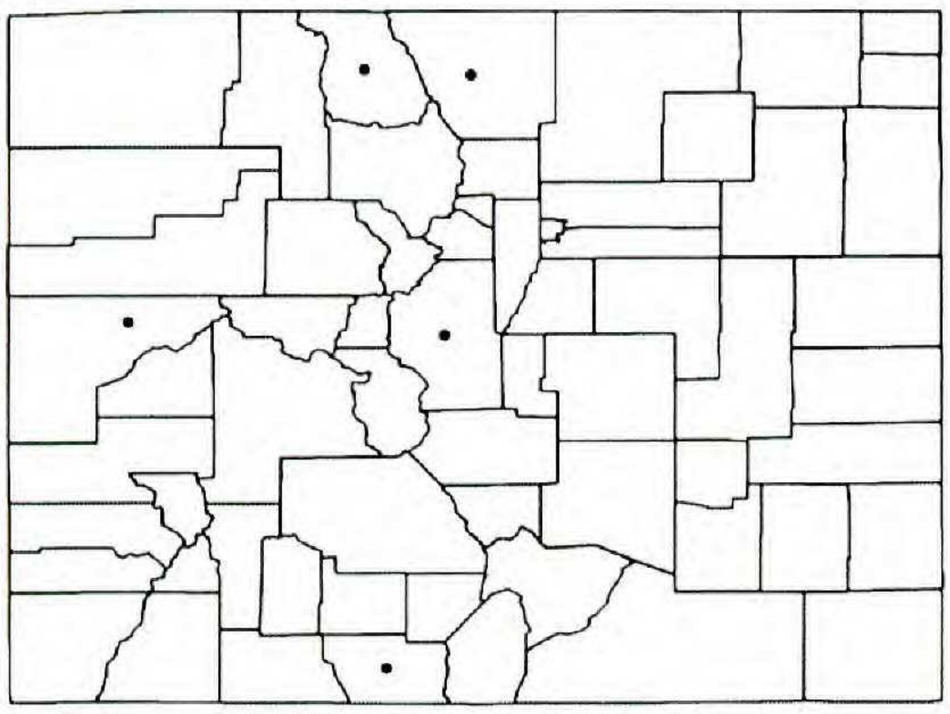
The shape and texture of basal leaves have long been of key taxonomic importance in the genus. The shape of the blade, base of the blade, and blade margins are the three most important characters. In general the basal leaves are



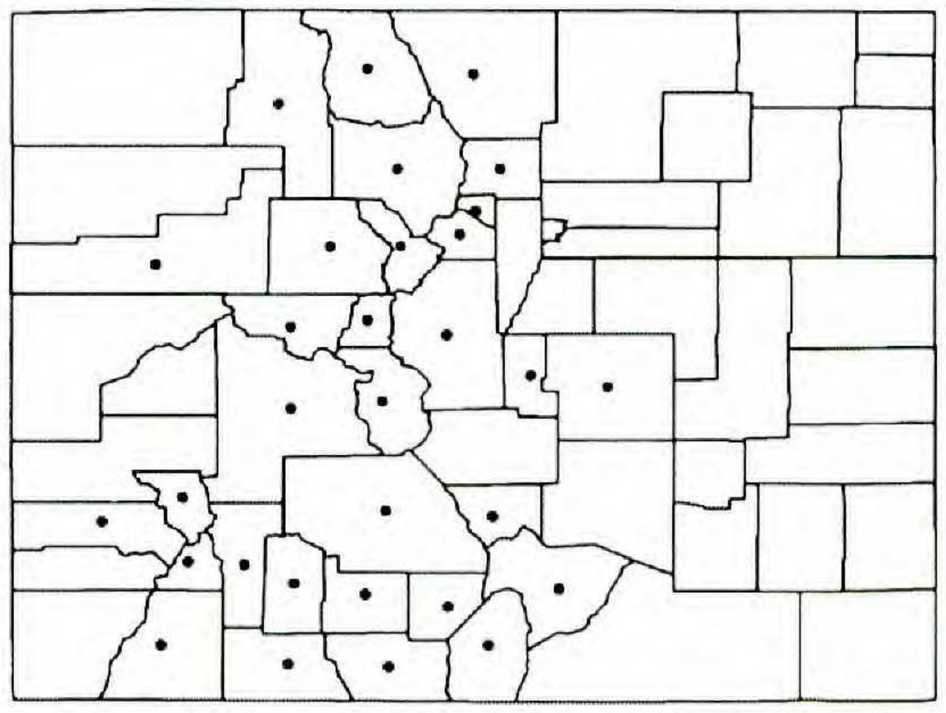
Packera cana



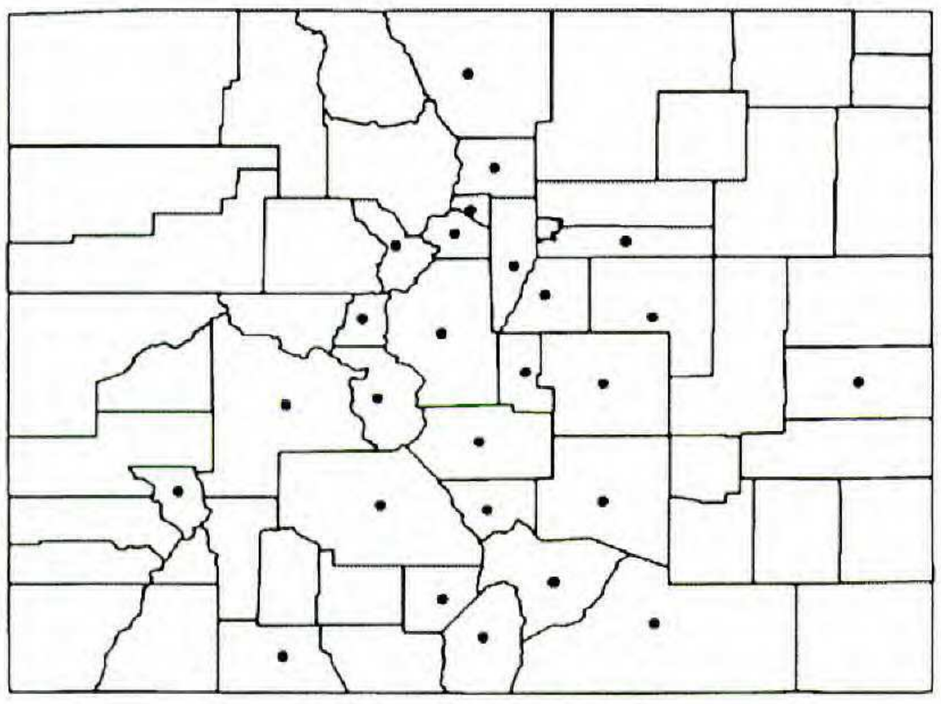
Packera crocata



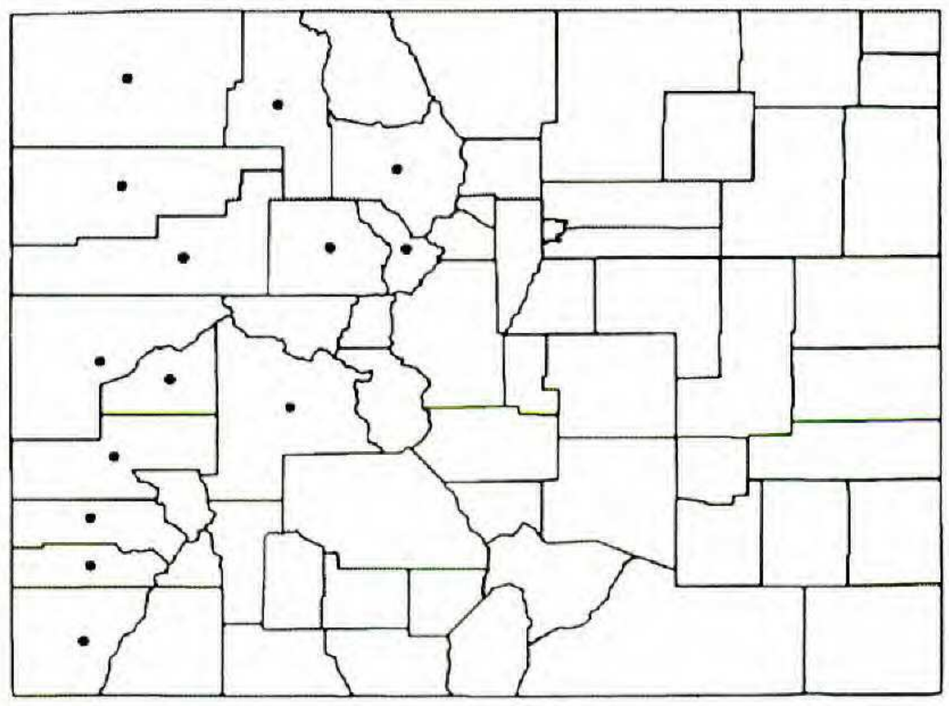
Packera debilis



Packera dimorphophylla var. dimorphophylla



Packera fendleri

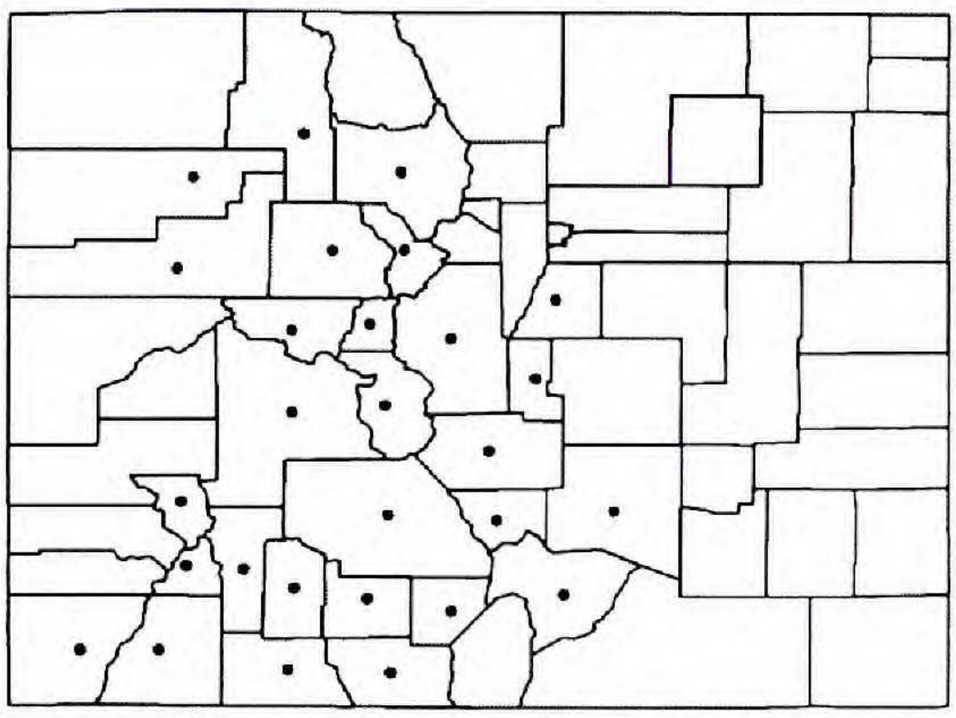


Packera multilobata

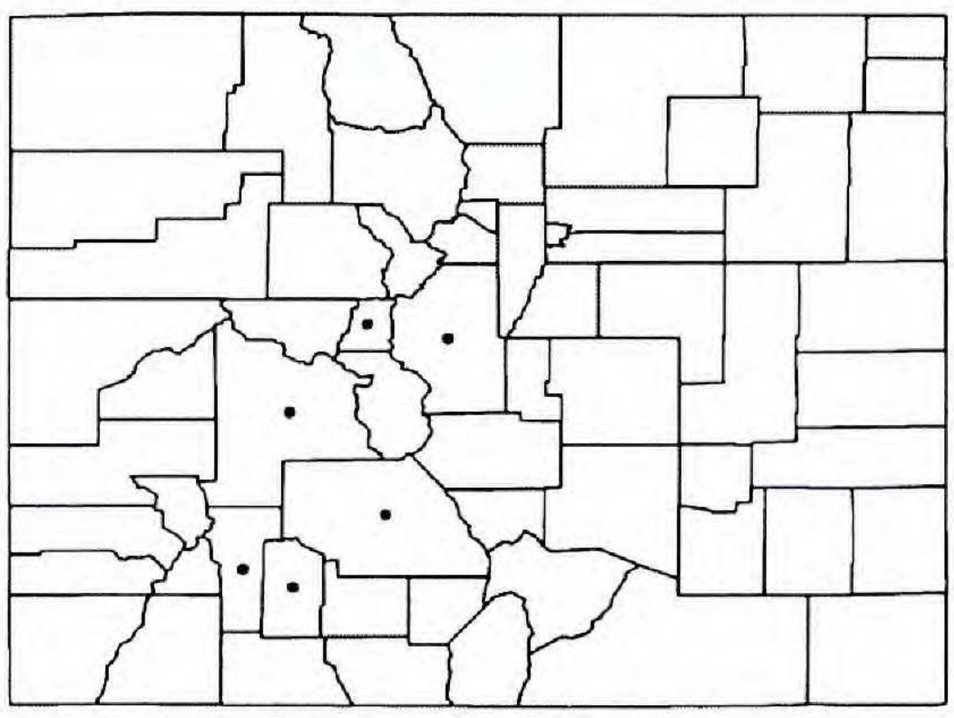
FIG. 1. Distribution maps for *Packera* species in Colorado. The records for each county are supported by at least one voucher specimen deposited in the herbaria cited in this paper.

petiolate. The only exception among Colorado Packeras is *P. werneriifolia*. Some individuals of this species have basal leaves that are sessile.

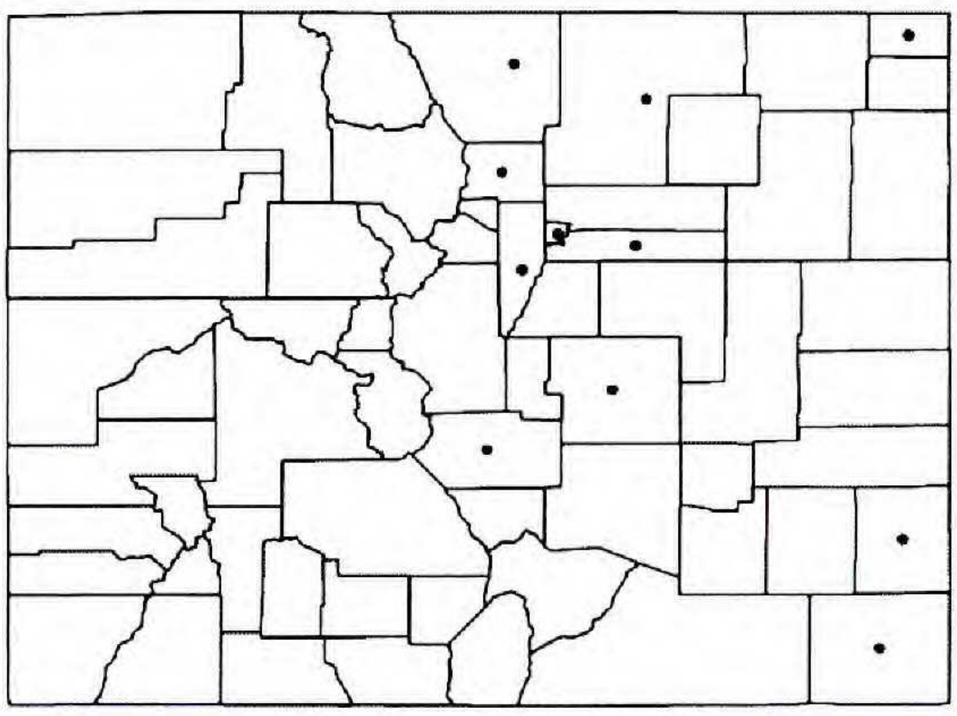
The shape and size of cauline leaves can also be useful, but there may be extreme variability within species. In all species of *Packera*, the basal leaves are arranged in rosettes, while the cauline leaves are either gradually, progres-



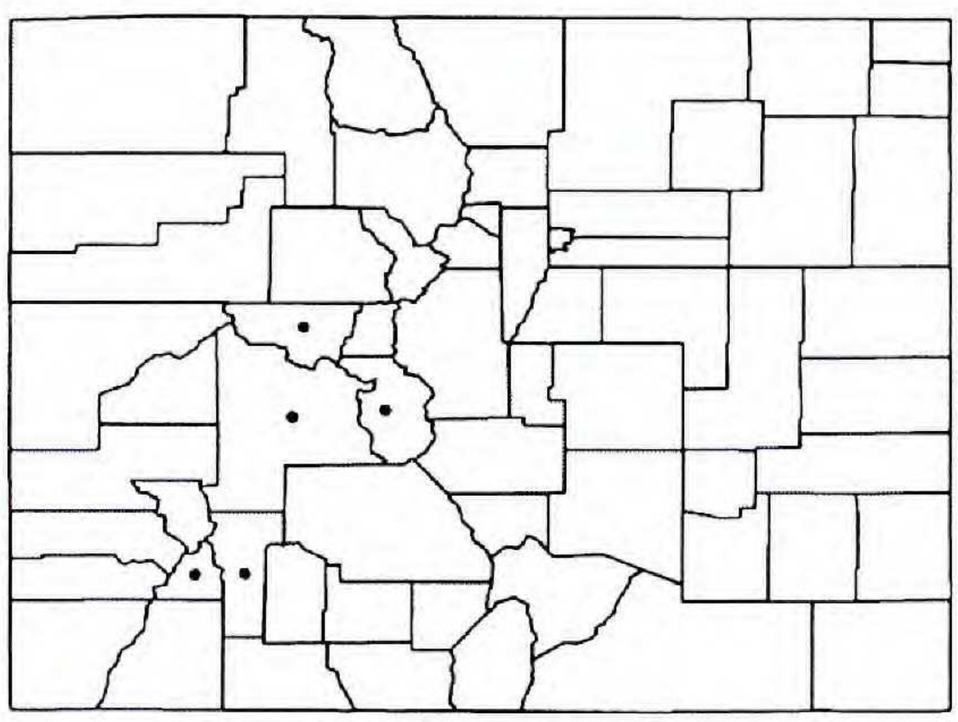
Packera neomexicanavar. mutabilis



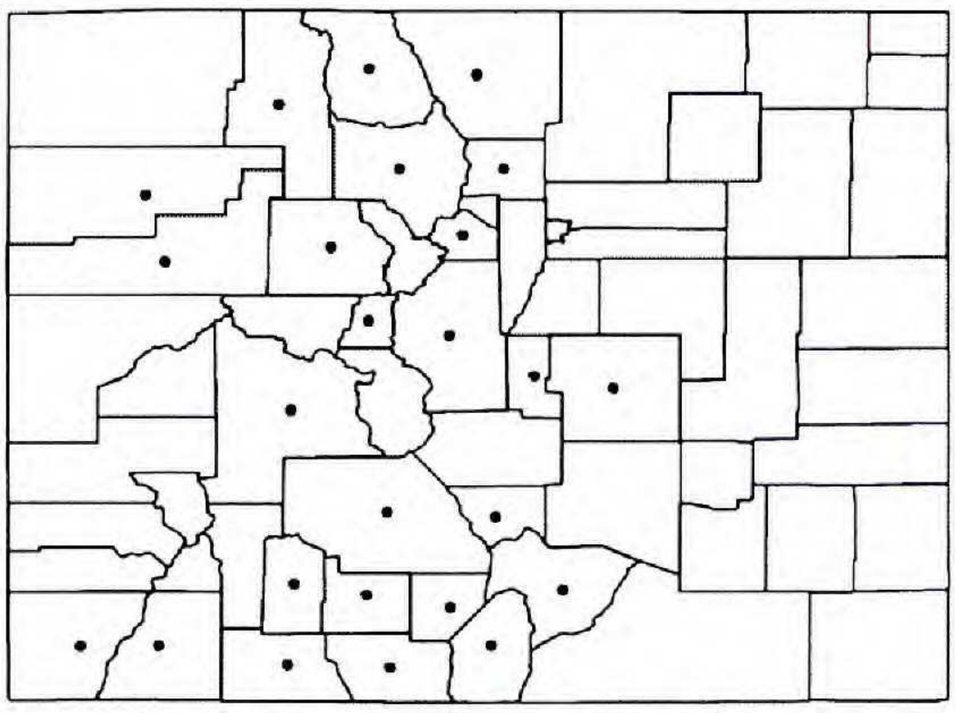
Packera paupercula



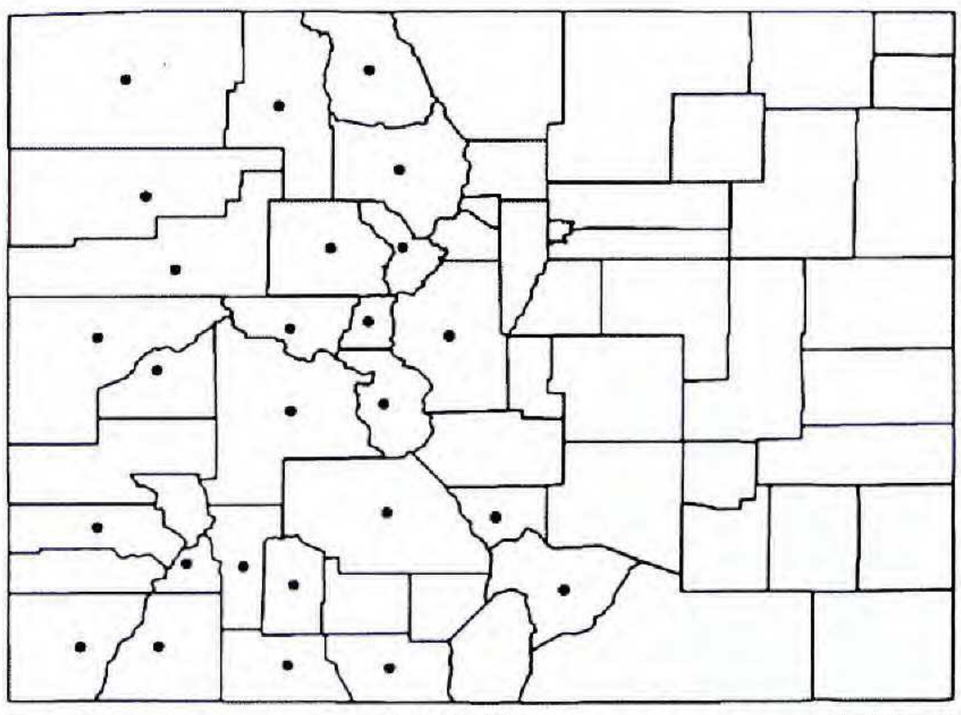
Packera plattensis



Packera porteri



Packera pseudaurea var. flavula



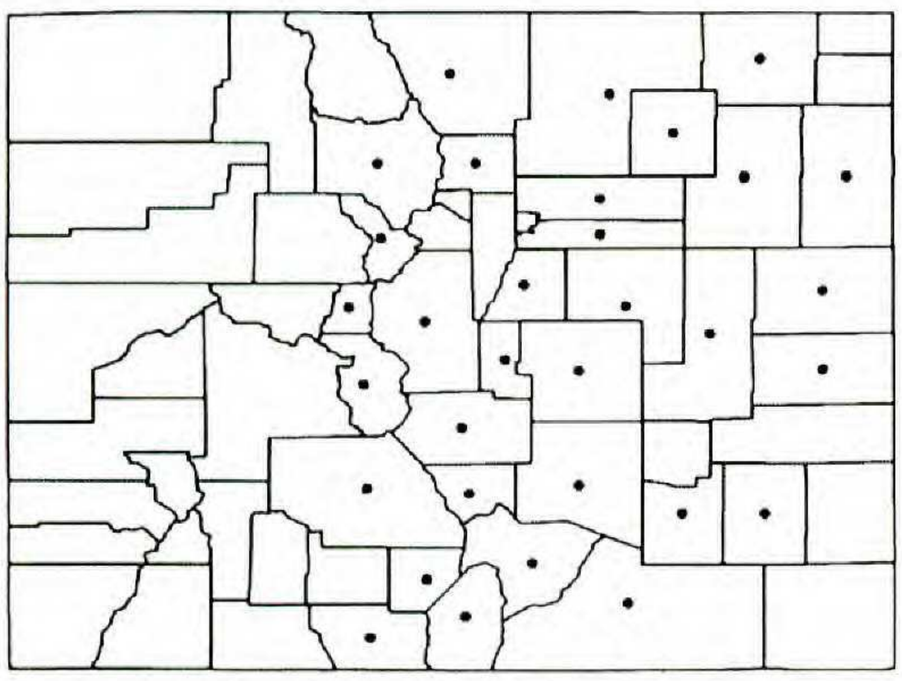
Packera streptanthifoliavar. streptanthifolia

FIG. 2. Distribution maps for *Packera* species in Colorado (continued).

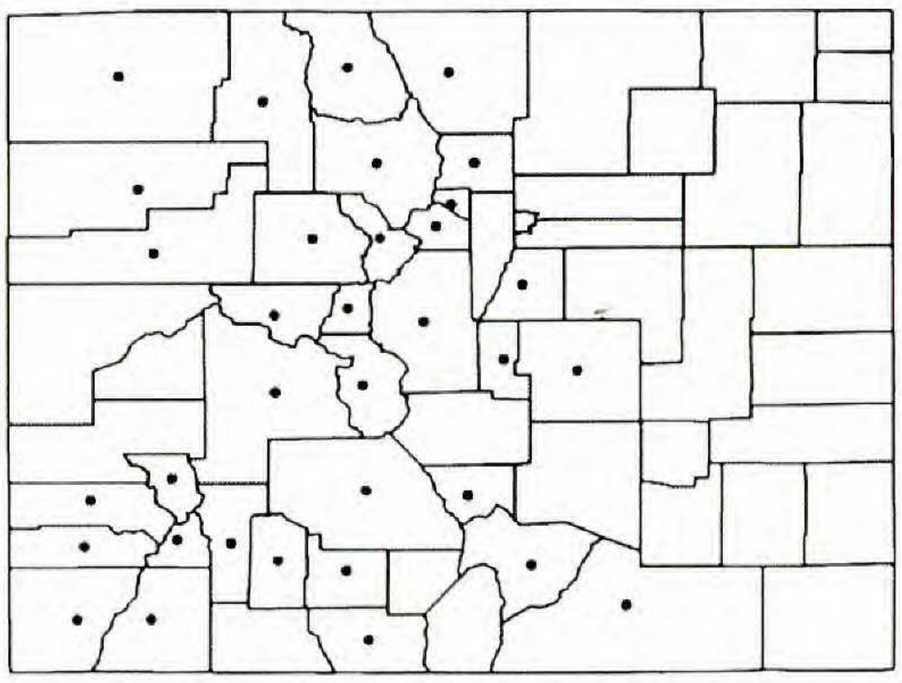
sively, or abruptly reduced upwards on the stem. In all species, the uppermost cauline leaves are sessile and most are bract-like.

The heads in the inflorescence are arranged in either subumbellate or corymbiform cymes. Two species (*P. porteri* and *P. werneriifolia*) nearly always have only one large terminal head or at most two or three smaller heads.

Most species of *Packera* have 8 or 10 or 13 ray florets per head. However, *P.*



Packera tridenticulata



Packera werneriifolia

FIG. 3. Distribution maps for *Packera* species in Colorado (continued).

debilis, is typically rayless. A few others, including *P. paupercula*, *P. porteri*, *P. pseudaurea*, and *P. werneriifolia* are occasionally rayless. In most species the florets are a bright yellow. *P. dimorphophylla var. dimorphophylla* and *P. crocata* frequently have florets that are deep orange-yellow to almost brick-red. *P. streptanthifolia* may have rays that are a deep orange-yellow as well.

Another character that is frequently used in descriptions is size and pubescence of the cypselae. While there is variation in size, *P. cana* has noticeably large fruits and *P. dimorphophylla* has noticeably small ones. Many species have glabrous fruits, but a few have tiny hairs along the ribs of the cypselae.

KEY TO THE PACKERAS OF COLORADO

1. Plants distinctly tomentose throughout, or occasionally glabrate.
   2. Margins of leaf blades shallowly but evenly pinnatifid to pinnatisect or merely wavy _____ **P. fendleri**
   2. Margins of leaf blades variously entire or dentate, but not pinnatifid.
      3. Plants with 1–3(–5) large heads, alpine to sub-alpine, scapose or with cauline leaves reduced to mere bracts _____ **P. werneriifolia**
      3. Plants without the above combination of characters.
         4. Plants persistently lanate or canescent, leaf blades ovate or elliptic, or rarely broadly lanceolate, leaf margins entire or merely wavy _____ **P. cana**
         4. Plants with persistent dense tomentum at least at the base of the stem and in leaf axils. Lightly tomentose elsewhere, glabrescent with age.
            5. Basal leaves lanceolate, oblanceolate or narrowly elliptic, lower cauline leaves similar to basal leaves, calyculate bracts long and conspicuous. Plants of open meadows and coniferous woodlands at mid to high elevation _____ **P. neomexicana** var. **mutabilis**
            5. Basal leaves elliptic to ovate or oblanceolate, lower cauline leaves lyrate to pinnatisect, calyculate bracts few and inconspicuous. Plants of open prairies and grasslands _____ **P. plattensis**
1. Plants glabrous, may be tomentose when young, or persistently so in the axils of the leaves and at the base of the stem; or rarely lightly pubescent throughout.
   6. Heads rayless or ray florets much reduced, involucres greenish with anthocyanic

tips; lower and mid-cauline leaves pinnately lobed with deep rounded sinuses _____ **P. debilis**

6. Heads radiate, or if rays lacking only 1 head per stem and involucres deeply anthocyanic.
   7. Plants with a single large head; involucres deeply anthocyanic, basal leaves reniform to subreniform, cauline leaves reduced to bracts, plants of alpine scree slopes _____ **P. porteri**
   7. Plants with few to several heads, involucres and leaves without the above combination of characters.
      8. Basal leaf blades narrowly to broadly lanceolate, oblanceolate or narrowly elliptic.
         9. Lower cauline leaves similar to basal leaves, upper ones becoming sessile; calyculate bracts conspicuous and numerous but small; cypselae hirtellous along the angles; plants of prairies and sagebrush habitats _____ **P. tridenticulata**
         9. Lower cauline leaves various; calyculate bracts either few and inconspicuous or large and conspicuous; cypselae glabrous; plants of mountain or wet meadow habitats.
            10. Involucres dark green, often with anthocyanic tips; heads with numerous large conspicuous calyculate bracts _____ **P. streptanthifolia** var. **streptanthifolia**
            10. Involucres light green, tips not distinctly anthocyanic; calyculate bracts few and inconspicuous.
               11. Leaf blades broadly lanceolate to ovate; base of leaf blades truncate to subcordate or occasionally obtuse; lower cauline leaves sublyrate to subentire; middle and upper cauline leaves sessile and frequently clasping _____ **P. pseudaurea** var. **flavula**
               11. Leaf blades lanceolate to narrowly elliptic; base of leaf blades tapering to cuneate or obtuse, but never subcordate; lower cauline leaves often sublyrate or with margins variously dissected, but rarely subentire; middle and upper cauline leaves mere sessile bracts _____ **P. paupercula**
      8. Basal leaf blades broadly elliptic, obovate or oblanceolate to ovate or orbicular.
         12. Leaf margins lobed or pinnatifid; plants of sandy sagebrush habitats _____ **P. multilobata**
         12. Leaf margins variously dentate to crenate or shallowly lobed but never pinnatifid; plants of alpine to subalpine habitats.
            13. Lower and middle cauline leaves sessile, conspicuously clasping and auriculate _____ **P. dimorphophylla** var. **dimorphophylla**
            13. Lower and middle cauline leaves sessile or petiolate, may be weakly clasping but never auriculate.
               14. Leaf blades thin, margins entire to weakly crenate or merely wavy; upper cauline leaves sessile and weakly clasping; rays often deep orange yellow or brick red; calyculate bracts few or absent; plants of sub-alpine meadows _____ **P. crocata**
               14. Leaf blades thick and turgid, margins variously entire to conspicuously dentate; upper cauline leaves sessile and reduced to mere bracts; rays deep yellow, but never reddish; calyculate bracts conspicuous; habitats from damp to drying ____ **P. streptanthifolia** var. **streptanthifolia**

SPECIES DESCRIPTIONS AND COMMENTS ON IDENTIFICATION

Packera cana (Hook.) W.A. Weber & A. Löve, Phytologia. 49:46. 1981. *Senecio canus* Hook.

Senecio purshianus Nutt.; *Senecio canus* var. *purshianus* A. Nelson; *Senecio canus* var. *eradiatus* D.C.; *Senecio howellii* Greene; *Senecio hallii* Britton; *Senecio harbourii* Rydb.; *Senecio convallium* Greenm.; *Senecio oreopolus* Greenm.; *Senecio hallii* var. *discoidea* W.A. Weber

Perennials. **Caudices** stout, branching rhizomatous, suberect. **Stems** single from a rosette, or clustered rosettes, densely lanate-pubescent or canescent. **Basal leaves** petiolate, blades ovate or elliptic to lanceolate, 2.5–5+ × 1–3 cm, bases tapering, margins entire or irregularly undulate to weakly dentate, persistently canescent on lower surface, canescent to subglabrescent on upper surface. **Cauline leaves** petiolate to sessile and weakly clasping, progressively reduced distally, elliptic to lanceolate, margins entire to weakly dentate. **Heads** radiate, 8–15+ in corymbiform arrays. Peduncles bracteolate, densely lanate to floccose tomentose, subglabrescent in some populations. **Calyculi** present, inconspicuous, tomentose. **Phyllaries** 13 or 21, green, 5–8+ mm, densely tomentose. **Ray florets** 8–10 or 13, laminae 8–10+ mm. **Disc florets** 35–50+; corolla tubes 2.5–3.5 mm, limbs 3.5–4.5 mm. **Cypselae** 2.5–3.5+ mm long, glabrous, pappi 4.5–7 mm long. 2n=46.

Packera cana is found on open high plains and in sagebrush associations. It is also collected from dry rocky slopes and from crevices on both granitic and limestone outcrops. It flowers from late June into August, depending on latitude and elevation and is very abundant in Colorado. Although this species is found on grasslands in Wyoming, Montana, North Dakota, South Dakota, and Nebraska, it is rarely found on the high plains of the eastern part of Colorado.

Probably the only other species in Colorado with which it can be confused is *P. werneriifolia*. Two features contribute to this potential confusion: 1) At very high elevations *P. cana* may be very short (< 10 cm); 2) *P. werneriifolia* can be nearly as pubescent as *P. cana*.

There are two features distinguishing these two species: 1) *P. cana* nearly always has more than 3 heads in the inflorescence. At high elevations the inflorescence is often very compact, and the heads are small. *Packera werneriifolia*, on the other hand, normally has only 1 or two large heads. It can occasionally have 3–5 heads, in which case they are smaller than normal. 2) *P. cana* always has some cauline leaves even if they are very reduced and mostly on the lower portion of the stem, while *P. werneriifolia* is nearly always scapose, or in some very robust specimens, may have a few bract-like leaves on the stem.

Packera crocata (Rydb.) Weber & Löve, Phytologia. 49:46. 1981. *Senecio crocatus* Rydb.

Senecio aureus var. *croceus* A. Gray; *Senecio pyrrochrous* Greene; *Senecio tracyi* Rydb.

Perennials. **Caudices** long, stout, horizontal to ascending. **Stems** 2–6+ dm, single or rarely 2–3 clustered, glabrous. **Basal leaves** thin petiolate, blades narrowly lanceolate or ovate to oblong ovate, 2–6+ × 1–4+ cm, bases abruptly contracted

to tapering, margins subentire to crenate-dentate. **Cauline leaves** petiolate to sessile and weakly clasping, progressively reduced distally, lanceolate to oblong, margins sublyrate or lobed. **Heads** radiate, 7–15+ in open corymbiform arrays. Peduncles absent or small and inconspicuous, glabrous. **Calyculi** absent or few and small. **Phyllaries** 13 or 21, light green or with reddish tips, 4–8 mm, glabrous. **Ray florets** 8 or 13, corolla laminae 6–8+ mm, deep yellow to orange-red. **Disc florets** 60–80+; corolla tubes 4.5–5.5 mm, limbs 2.5–3.5 mm. **Cypselae** 1–1.5 mm long, glabrous, pappi 3–5 mm long. 2n=46.

This species grows in wet meadows often associated with grasses, sedges and willows, along trails and in rocky outcrops at middle to subalpine elevations and flowers from early July to mid-August. The only species that it may be confused with is *P. dimorphophylla* var. *dimorphophylla*. Three features distinguish these two species: 1) *P. crocata* has an open inflorescence, while that of *P. dimorphophylla* var. *dimorphophylla* is compact and congested. 2) *P. dimorphophylla* has dramatically large, auriculate, and conspicuously clasping middle and upper cauline leaves. While *P. crocata* may have larger than normal cauline leaves, they are at most weakly clasping. 3) While both species generally grow in wet places, *P. crocata* grows at elevations of ca. 8,000 – 10,000 feet and is fairly tall and thin, while *P. dimorphophylla* var. *dimorphophylla* is almost never found below 10,000 feet and is normally a more compact plant.

It is frequently noted in the literature that *P. crocata* has orange to reddish ray florets. However, *P. crocata* sometimes produces deep yellow ray florets, and *P. dimorphophylla* var. *dimorphophylla* may produce orangish ray florets.

Packera debilis (Nutt.) W.A. Weber & A. Löve, Phytologia. 49:46. 1981. *Senecio debilis* Nutt.

Senecio fedifolius Rydb.

Perennials. **Caudices** short, weakly branching. **Stems** 20–50+, single or 2–4 clustered, bases lightly floccose-tomentose or glabrous, leaf axils tomentose. **Basal leaves** petiolate and turgid, blades elliptic to ovate or subreniform, 2–4+ cm × 1.5–3+ cm, bases cuneate to subcordate, margins subentire or crenate to crenate-dentate. **Cauline leaves** petiolate to sessile, progressively reduced distally, blades pinnate-lobed, sinuses deep and rounded, lobes with entire to subentire margins. **Heads** eradiate, 6–20+ in open or compact corymbiform arrays. Peduncles present, short and conspicuous or absent, glabrous or lightly pubescent. **Calyculi** present, few and inconspicuous. **Phyllaries** 13 or 21, green with reddish tips, 6–8+ mm, glabrous. **Ray florets** absent. **Disc florets** 45–65+, corolla tubes 3–4 mm, limbs 2–3 mm. **Cypselae** 1–2 mm long, glabrous, pappi 4.5–5.5 mm long. 2n=46.

This is a distinctive plant of central and northern Colorado. It is collected frequently in Park County and less frequently in northern counties at mid to subalpine elevations in open meadows with alkaline soils. *Packera debilis* is sometimes identified as *P. pauciflora*, which is also a rayless plant with reddish

involucres. However, *P. pauciflora* is a plant with a more northerly distribution (it does not occur in Colorado) and a suite of characteristics that distinguish it from *P. debilis*. 1) *Packera debilis* generally has more than 6 heads in the inflorescence while *P. pauciflora* normally has 6 or fewer large heads. 2) *Packera debilis* has very short bracteoles on the peduncles, while *P. pauciflora* has very large conspicuous ones. 3) *Packera debilis*, has very few greenish, inconspicuous calyculate bracts. *P. pauciflora*, on the other hand, has long calyculate bracts that are normally quite reddish in color or at least have red tips. 4) The involucral bracts of *P. debilis* may display reddish coloration on the upper one-half to one-third of the tips, but the involucres of *P. pauciflora* are normally deeply anthocyanic throughout. 5) Probably the most easily distinguished characteristic concerns the lobing of the mid-cauline leaves. The terminal lobe of the leaves on *P. debilis* is narrow and pointed, and the sinuses of the individual lobes are deep and rounded.

Although *P. debilis* has been known at least from Park, Larimer, and Jackson counties for many years, it is very infrequently collected and is confined to alkaline meadow habitats. It may indeed be worthy of special note, and an effort should be made to document existing populations.

Packera dimorphophylla (Greene) var. **dimorphophylla** W.A. Weber & A. Löve, Phytologia. 49:46. 1981. *Senecio dimorphophyllus* Greene var. *dimorphophyllus*.

Perennials. **Caudices** short, stout, fibrous-rooted, horizontal to erect. **Stems** 1–3+ dm, single or rarely 2–3 clustered, simple or branched, glabrous. **Leaves:** basal leaves petiolate, thick and turgid, blades varying from ovate to subreniform or occasionally oblanceolate, bases tapering to a broad-winged petiole, margins entire to crenate; lower and mid-cauline leaves sessile, conspicuously clasping and auriculate, blades as large or larger than basal leaves, oblanceolate, obovate or lyrate, margins subentire to bluntly and irregularly dissected; upper cauline leaves usually reduced to sessile bracts, occasionally large and conspicuous. **Heads** radiate, 1–6+ in congested corymbiform or subumbellate arrays. Peduncles inconspicuously bracteolate or bracteoles absent, glabrous. **Calyculi** conspicuous, bases swollen. **Phyllaries** 13 or 21, occasionally fewer, green with anthocyanic apices, 5–7+ mm, glabrous. **Ray florets** 8 or 13, deep yellow to orange, corolla laminae 5–8+ mm. **Disc florets** 45–60+, corolla tubes 2–3 mm, limbs 2.5–3.5 mm. **Cypselae** 0.75–1.5 mm long, glabrous, pappi 3–4 mm long. 2n = 46.

This species is quite distinctive and is only rarely confused with one other entity in Colorado, *P. crocata*. A discussion of the characters used to separate the two species is found with the description of *P. crocata*. It is found at elevations generally over 10,000 feet in damp meadows or in seeps and crevices on hillsides. It flowers from early July to mid-August.

Packera fendleri (A. Gray) W.A. Weber & A. Löve, Phytologia. 49:46. 1981. *Senecio fendleri* A. Gray

Senecio nelsonii Rydb.; *Senecio salicinus* Rydb.; *Senecio canovirens* Rydb.; *Senecio rosulatus* Rydb.; *Senecio fendleri* var. *molestus* Greenm.

Perennials. **Caudices** rhizomatous, prominent lateral branches, horizontal to suberect. **Stems** 1–4+ dm, single or crowded to subcaespitose in some populations, floccose-tomentose or glabrescent. **Basal leaves** petiolate, blades lanceolate to oblanceolate, 3–6+ × 1–3+ cm, bases tapering, margins shallowly but evenly pinnatifid to pinnatisect or merely wavy, permanently floccose-tomentose or subglabrescent on upper surface. **Cauline leaves** sessile, gradually reduced distally, lanceolate to oblanceolate, margins pinnatisect to wavy. **Heads** radiate, 6–25+ in open or compact corymbiform arrays. Peduncles with numerous small bracteoles, heavily to irregularly floccose. **Calyculi** present but few and short, red tinged. **Phyllaries** 13, green, 5–7 mm, floccose proximally to glabrescent distally. **Ray florets** 6–8+, corolla laminae 5–7 mm. **Disc florets** 30–40+; corolla tubes 2.5–3 mm, limbs, 2.5–3.5 mm. **Cypselae** 2.5–3 mm long, glabrous, pappi 4–5 mm long. 2n=46.

This species is rarely confused with other Colorado Packeras. Some individuals, with merely wavy leaves could be mistaken for *P. cana*, but close inspection should easily separate the two. *Packera fendleri* is very abundant and almost weedy where it occurs. It prefers steep slopes in loose, dry rocky or gravelly soil, streamsides, open forested areas, and disturbed sites such as roadsides and picnic areas. It flowers any time between the end of May and early October throughout its range, depending on elevation.

Packera multilobata (Torr. & A. Gray ex A. Gray) W.A. Weber & A. Löve, Phytologia. 49:47. 1981. *Senecio multilobatus* Torr. & A. Gray ex. A. Gray

Senecio lynceus Greene; *Senecio nelsonii* var. *uintahensis* A. Nelson; *Senecio uintahensis* Greenm.; *Senecio stygius* Greene; *Senecio prolixus* Greenm.; *Senecio leucoreus* Greenm.; *Senecio thornberi* Greenm.

Perennials or biennials. **Caudices** weakly branching, taprooted, ascending to erect. **Stems** 2–4+ dm, single or 2–5 loosely clustered, glabrous or glabrescent, occasionally lightly tomentose throughout, axils of basal leaves with tufts of tomentum. **Leaves:** basal and lower cauline leaves petiolate, blades obovate, oblanceolate or spatulate, 4–8+ × 1–3+ cm, bases tapering, margins deeply pinnatifid or lyrate to sublyrate, leaf segments variously toothed and rounded; middle and upper cauline leaves progressively reduced distally, sessile. **Heads** radiate, 10–30+ in open corymbiform or subumbellate arrays. Peduncles conspicuously bracteolate, glabrous or with tufts of tomentum. **Calyculi** present and obvious. **Phyllaries** 13–21, green often with yellow tips, 4–9+ mm, glabrous to lightly tomentose proximally. **Ray florets** 8–13, corolla laminae 7–10 mm. **Disc florets** 40–50+, corolla tubes 4–5 mm, limbs 3–4 mm. **Cypselae** 2–3 mm long, glabrous or hirtellous on the angles, pappi 5–6 mm long. 2n = 46 or 92

This species is also rarely confused with any others in Colorado. *P.*

multilobata and *P. fendleri* are the only distinctly lobed or pinnatifid Packeras in the state. *Packera fendleri* is consistently very pubescent and *P. multilobata* is nearly always glabrous. *Packera multilobata* occurs on the western slope but thus far has not been recorded from counties along the Rocky Mountain Front. It prefers dry rocky or sandy substrates in habitats as varied as desert sagebrush, juniper woodlands, and subalpine forests. It flowers in early May at lower elevations and as late as mid-July at higher elevations.

Packera neomexicana (Greene) var. **mutabilis** W.A. Weber & A. Löve, Phytologia. 49:47. 1981. *Senecio mutabilis* Greene; *Senecio neomexicanus* var. *mutabilis* (Greene) T.M. Barkley.

Perennials. **Caudices** branched, weakly spreading, horizontal or ascending to erect. **Stems** 2–5+ dm, single or 2–3 clustered, densely lanate or arachnoid tomentose or glabrescent. **Basal leaves** petiolate, blades lanceolate or narrowly lanceolate, 2–6+ × 1–3+ cm, bases tapering, margins subentire to dentate, permanently but loosely tomentose throughout. **Cauline leaves** progressively reduced distally; lower leaves petiolate and similar to basal leaves; mid to upper cauline leaves becoming sessile, blades lanceolate, margins entire. **Heads** radiate, 3–20+ in open or compact corymbiform to subumbelliform arrays, subtended by smaller cymes arising from leaf axils. Peduncles conspicuously bracteolate, normally pubescent. **Caylculi** present and conspicuous. **Phyllaries** 13 or 21, green or yellowish, 4–7 mm, tomentose to glabrescent. **Ray florets** 8 or 13, occasionally 5, corolla laminae 4–10 mm. **Disc florets** 40–60+, corolla tubes 1.5–2.5 mm, limbs 3.5–4.5 mm. **Cypselae** 1.5–2.5 mm long, hirtellous on the angles or infrequently glabrous, pappi 5–6+ mm long. 2n = 46 or 92

This species flowers from late April to mid-July. It is frequently confused with *Packera tridenticulata*. Four characteristics, when taken in combination, can help to distinguish these two entities.

1) *P. tridenticulata* is a plant of the high plains and foothills in Colorado. In a few cases, it has apparently "jumped" the Rocky Mountain Front and has been collected growing in some of the interior valleys, usually in grassland/sagebrush associations. On the other hand, *P. neomexicana* var. *mutabilis* is generally found growing in rocky soils in open meadows and coniferous woodlands at high elevations.

2) *P. tridenticulata* usually grows in obvious clumps from a stout taprooted caudex, while *P. neomexicana* var. *mutabilis* normally has no more than 2–3 stems arising from a branching caudex.

3) *P. tridenticulata* tends to have slightly smaller achenes that are normally glabrous or at most lightly hirtellous along the angles, while *P. neomexicana* var. *mutabilis* has achenes that are a bit larger and normally distinctly hirtellous along the angles.

4) *P. tridenticulata* collected from the eastern part of its range is always glabrous. In the western part of its range, and in the interior valleys west of the Rocky Mountain Front, entities that would otherwise be easily identified as *P. tridenticulata* often show some very light pubescence at stem bases and in leaf axils. *Packera neomexicana* var. *mutabilis* is always loosely but persistently tomentose at least at the base of the stem, in the axils of the leaves, and at the base of the inflorescence. The lower leaf blades are also almost always lightly pubescent.

The center of distribution for *P. neomexicana* var. *mutabilis* is in the four-corners region, while *P. tridenticulata* is primarily a plant of the high plains and short-grass prairies. There is good evidence for hybridization between these two entities, primarily in the high valleys around Alamosa in south-central Colorado. There are several specimens in the herbaria at Adams State College in Alamosa and Colorado College in Colorado Springs with characters that are intermediate between *P. neomexicana* and *P. tridenticulata*. Several specimens display all the characteristics of *P. tridenticulata*, but are unusually and persistently tomentose, while others that are obviously glabrous have hirtellous achenes. Biosystematic work on these two species throughout the central valleys of Colorado would undoubtedly shed light on the complicated relationships in this complex.

Packera neomexicana var. *mutabilis* is infrequently confused, with *P. streptanthifolia* and *P. fendleri*. Some specimens of *P. fendleri* with merely wavy leaves and less than the normal amount of tomentum have been misidentified as *P. neomexicana* var. *mutabilis*. *Packera streptanthifolia* is a highly variable species with a number of identifiable "phases." The narrow-leaved phase of *P. streptanthifolia* is sometimes difficult to distinguish, but once again, careful observation of a combination of characters should provide accurate identifications.

Packera paupercula (Michx.) Löve & Löve, Bot. Not. 128:520. 1976. *Senecio pauperculus* Michx.

Senecio balsamitae Muhl. ex Willd.; *Senecio flavovirens* Rydb.; *Senecio crawfordii* Britton; *Senecio tweedyi* Rydb.; *Senecio multnomensis* Greenm.; *Senecio gaspensis* Greenm.

Perennials. **Caudices** sub-rhizomatous, weakly branching, ascending to erect. **Stems** 2–4.5+ dm, single or 2–4 loosely clustered, glabrous or lightly tomentose proximally. **Leaves**: basal leaves petiolate, blades lanceolate to narrowly elliptic or oblanceolate, 3–6+ × 1–2+ cm, bases tapering to cuneate or obtuse, margins subentire to variously dentate or serrate. Cauline leaves progressively reduced distally; lower ones petiolate, blades sublyrate; middle ones sessile, blades lanceolate, margins variously dissected, incised or lacerate; upper ones sessile bracts. **Heads** radiate, 2–10+ in loose or compact corymbiform arrays. Peduncles bracteolate or bracteoles occasionally absent, glabrous. **Calyculi** present and inconspicuous. **Phyllaries** 13 or 21, green, 5–8+ mm, glabrous. **Ray florets** 8 or 13, or occasionally absent, corolla laminae 5–10+ mm. **Disc florets** 50–65+, corolla

tubes 2–3 mm, limbs 2–3 mm. **Cypselae** 1–2 mm long, glabrous or occasionally hispidulous on the angles, pappi 3.5–4.5 mm long. 2n = 44 or 46.

Packera paupercula is the most ecologically and morphologically variable *Packera* in North America. Although widespread, it has been infrequently collected in Colorado. It flowers from late June to late July in Colorado and can be found in wet meadows, open woodlands, and along streambanks. In areas of sympatry, *P. paupercula* can be confused with *P. plattensis*, but that is not a problem in Colorado because *P. plattensis* is confined to the high plains and *P. paupercula* has only been collected from mountainous regions.

The other species with which *P. paupercula* could easily be confused is *P. pseudaurea* var. *flavula*. There are six characteristics that can be used in combination to separate these two entities: 1) Basal and lower leaf blades of *P. paupercula* are lanceolate to narrowly elliptic, and normally 1.5–3 times longer than wide. Those of *P. pseudaurea* var. *flavula* are broadly lanceolate to ovate, and 1–2 times longer than wide; 2) Bases of the leaf blades of *P. paupercula* are tapering, those of the *P. pseudaurea* var. *flavula* are truncate to subcordate; 3) Upper cauline leaves of the former are sessile, those of the latter are weakly clasping; 4) Phyllaries of *P. paupercula* specimens from Colorado normally number 13 and are 5–8 mm long, those of *P. pseudaurea* var. *flavula* usually number 21 and are 3–5 mm long; 5) *P. paupercula* normally has 40–50 disc florets in a one head, *P. pseudaurea* var. *flavula* has 60–80; 6) Corolla tubes of the disc florets in *P. paupercula* are about the same length as the limbs, 2–3 mm, however in *P. pseudaurea* var. *flavula*, the corolla tubes are much longer than the limbs, 3.5–4.5 mm and 2–3 mm, respectively.

Packera plattensis (Nutt.) W.A. Weber & Löve, Phytologia. 49:48. 1981. *Senecio plattensis* Nutt.

Senecio pseudotomentosus Mackenzie & Bush.

Perennials or biennials. **Caudices** stoloniferous in eastern populations, fibrous rooted elsewhere, erect or suberect. **Stems** 2–6+ dm, single or 2–3 clustered, persistently floccose-tomentose proximally and in leaf axils, lightly tomentose or glabrescent elsewhere. **Leaves:** basal and lower cauline leaves petiolate, blades narrowly elliptic to elliptic-ovate or oblanceolate to suborbicular, abaxial surface subpersistently floccose-tomentose, especially along the mid-vein, 2–7+ × 1–3+ cm, bases tapering to rounded or abruptly contracted, margins subentire to crenate, serrate-dentate, or sublyrate; middle cauline leaves progressively reduced distally, short petiolate, blades sub-lyrate to pinnatisect, lightly pubescent on the abaxial surface; upper cauline leaves, sessile, subentire to irregularly dissected. **Heads** radiate, 6–20+ in open or congested corymbiform arrays. Peduncles abundantly bracteolate, lightly to heavily tomentose. **Calyculi** numerous but inconspicuous. **Phyllaries** 13 or 21, green or occasionally with reddish tips, 5–6+ mm, densely tomentose distally, glabrescent above. **Ray florets**

8–10, corolla laminae 9–10 mm. **Disc florets** 60–70+, corolla tubes 2.5–3.5 mm, limbs 3.5–4.5 mm. **Cypselae** 1.5–2.5 mm long, hirtellous or occasionally glabrous, pappi, 6.5–7.5 mm long. 2n = 46 or 92.

Packera plattensis inhabits rocky, gravelly, or sandy/loam soils in open prairies and grasslands. It is found throughout eastern Colorado but in dry years may not be abundant. It occurs in the foothills of the Front Range, but to my knowledge has never been collected further west than that. *Packera plattensis* flowers from mid-May to mid-June in Colorado. The only other high plains *Packera* species in Colorado is *P. tridenticulata*, and these two species are rarely confused. *Packera plattensis* is always densely floccose-tomentose at the base of the stem and in the leaf axils and often persistently lightly tomentose elsewhere. *Packera tridenticulata* collected on the high plains is nearly always glabrous or at most very lightly tomentose at the base of the stem.

Packera porteri (Greene) C. Jeffrey, Kew Bull. 47:101. 1992. *Senecio porteri* Greene; *Ligularia porteri* (Greene) W.A. Weber

Senecio renifolius Porter; *Senecio aureus* var. *alpinus* A. Gray.

Perennials. **Caudices** with long slender branching rhizomes. **Stems** 3–10+ cm, single, often anthocyanic, glabrous. **Leaves**: basal leaves petiolate and turgid, blades reniform to sub-reniform, 0.5–1.5+ × 0.5–2.5+ cm, abaxial surface distinctly anthocyanic, bases abruptly contracted to cordate, margins distinctly crenate or occasionally wavy; cauline leaves abruptly reduced distally to 1–4 sessile bracts with entire margins. **Heads** radiate, 1 large terminal head, 10–15+ mm high. **Calyculi** present and conspicuous, often anthocyanic. **Phyllaries** 13 or 21, deep red, 8–10+ mm, glabrous. **Ray florets** 8 or 13, corolla laminae 8–10+ mm. **Disc florets** 40–50+, corolla tubes 2.5–3.5 mm, limbs 2.5–3.5 mm. **Cypselae** 1.5–2.5 mm long, glabrous, pappi 4–5.5 mm long.

Packera porteri is undoubtedly the most morphologically distinctive *Packera* in Colorado and the most restricted in range and habitat. It is confined to steep talus slopes in alpine habitats, rarely below 11,000 feet. It is most frequently collected west of the Continental Divide in two general locations: Gunnison and nearby counties, in the Elk Mountains around Gothic and in Maroon Bells/Snowmass Wilderness areas; and in San Juan and Hinsdale counties. However, it has also been collected east of the divide in Chaffee County. Due to its diminutive form and remote location, it may have been overlooked elsewhere. *Packera porteri* flowers from mid-July to mid-August.

Packera pseudaurea (Greene) var. **flavula** D.K. Trock & T.M. Barkley, Phytologia. 49:48. 1981. *Senecio pseudaureus* var. *flavulus* (Greene) Greenm.; *Senecio flavulus* Greene.

Perennials. **Caudices** simple or branched, fibrous-rooted, horizontal to erect. **Stems** 2–5+ dm, thin and slender, single or occasionally 2–4 clustered, glabrous or lightly tomentose proximally. **Leaves**: basal leaves petiolate, blades broadly

lanceolate to ovate or occasionally sub-hastate, 2–4+ × 2–3+ cm, bases truncate to subcordate or obtuse, margins bluntly dentate or denticulate, rarely sharply toothed; lower cauline leaves petiolate, blades sublyrate to lacinate or occasionally subentire; middle and upper cauline leaves progressively reduced distally, becoming sessile, occasionally clasping. **Heads** radiate, 5–12+ heads in a congested cyme. Peduncles inconspicuously bracteolate, glabrous. **Calyculi** present. **Phyllaries** 21 or occasionally 13, rarely 30 or more, light green, 3–6 mm, glabrous. **Ray florets** 8 or 13, corolla laminae 6–10+ mm, or occasionally absent. **Disc florets** 60–80+, corolla tubes 3.5–4.5 mm, limbs 2–3 mm. **Cypselae** 1–1.5 mm long, glabrous, pappi 4.5–5.5 mm long. 2n = 46

This variety of *P. pseudaurea* is found in the southern Rocky Mountains and is most abundant in Colorado. It inhabits the same habitat type as *P. paupercula*, and its gross morphology is similar. The comments following the description of *P. paupercula* provide a suite of six characteristics that can be used to distinguish the two entities. *Packera pseudaurea* var. *flavula* flowers from late May to early July. Where the two occur at similar elevations and in similar habitats, *P. pseudaurea* var. *flavula* usually flowers about one month earlier than *P. paupercula*.

Packera streptanthifolia (Greene) W.A. Weber & Löve var. **streptanthifolia**
Phytologia. 49:48. 1981. *Senecio streptanthifolius* Greene; *Senecio cymbalarioides* var. *streptanthifolius* (Greene) Greenm.

Senecio cymbalarioides Nutt.; *Senecio streptanthifolia* var. *laetiflorus* (Greene) J.F. Bain; *Senecio streptanthifolius* var. *rubricaulis* (Greene) J.F. Bain; *Senecio cognatus* Greene; *Senecio wardii* Greene; *Senecio adamsi* Howell; *Senecio suksdorfii* Greenm.; *Senecio longipetiolatus* Rydb.; *Senecio fulgens* Rydb.; *Senecio rydbergii* A. Nelson; *Senecio jonesii* Rydb.; *Senecio subcuneatus* Rydb.; *Senecio platylobus* Rydb.; *Senecio streptanthifolius* var. *oodes* (Rydb.) J.F. Bain; *Senecio oodes* Rydb.; *Senecio leonardii* Rydb.; *Senecio streptanthifolius* var. *kluanei* J.F. Bain; *Senecio streptanthifolius* var. *wallowensis* J.F. Bain.

Perennials. **Caudices** weak to stout, fibrous-rooted, horizontal to suberect. **Stems** 2–4+ dm, single or 2–5 clustered, glabrous or occasionally lightly floccose tomentose proximally and in leaf axils. **Leaves:** basal and lower cauline leaves, petiolate, thick and turgid, blades varying from oblanceolate or ovate to orbicular, 2–4+ × 1–3+ cm, bases tapering or abruptly contracted, margins entire, crenate, dentate or weakly lobulate, normally glabrous or sometimes persistently pubescent; middle and upper cauline leaves gradually reduced distally, becoming sessile, margins entire to sub-entire. **Heads** radiate, 6–15+ in loose corymbiform or subumbellate arrays. Peduncles variably bracteolate, glabrous or lightly tomentose. **Calyculi** present and conspicuous. **Phyllaries** 13 or 21, occasionally 8, green or with anthocyanic tips, 4–7+ mm, glabrous. **Ray florets** 8 or 13, corolla laminae 5–10 mm. **Disc florets** 35–60+, corolla tubes 2–4 mm, limbs 2.5–4 mm. **Cypselae** 1–2.5 mm long, glabrous, pappi, 3–6 mm long. 2n = 46.

Packera streptanthifolia grows in a wide variety of habitats, from forested

areas to open meadows and valleys and in soils ranging from dry and rocky to damp and loamy. It also occurs at a wide range of elevations, from 6500 feet to above timberline. The species is complex and has been divided by some researchers (Bain 1983, 1988) into as many as seven distinct taxa—five species and two varieties or two species and five varieties. This author recognizes only one species and two varieties, while acknowledging that there is a great amount of morphological variation. There is less morphological variation within this species in Colorado than there is in other parts of its range.

The narrow-leaved phase of *P. streptanthifolia* could superficially be confused with *P. neomexicana* var. *mutabilis*. However, the former has glabrous achenes, while achenes of the latter are normally hirtellous. *Packera streptanthifolia* in Colorado normally has leaves that are ovate to orbicular. Probably the most reliable characteristics are the thick and turgid leaf blades, and a very stout fibrous-rooted caudex. In Colorado, this species flowers from early June to early July at lower elevations and from mid-July to mid-August at high elevations.

Packera tridenticulata (Rydb.) W.A. Weber & Löve, Phytologia. 49:48. 1981. *Senecio tridenticulatus* Rydb.

Senecio compactus Rydb.; *Senecio densus* Greene; *Senecio oblanceolatus* Rydb.; *Senecio acutidens* Rydb.; *Senecio manitobensis* Greenm.; *Senecio remifolius* Wooton & Standley.

Perennials. **Caudices** taprooted, ascending to erect. **Stems** 1–3+ dm, single or frequently several clustered, glabrous or rarely lightly floccose-tomentose, often with tufts of tomentum in leaf axils. **Leaves:** basal and lower cauline leaves petiolate, blades thick and turgid, lanceolate or narrowly oblanceolate, 2–4+ × 0.5–1.5 cm, bases tapering, margins entire, subentire or dentate at the apex, occasionally sub-pinnatisect; middle and upper cauline leaves gradually or progressively reduced distally, becoming sessile. **Heads** radiate, 4–15+ heads in corymbiform arrays. Penduncles bracteolate, glabrous to lightly tomentose. **Calyculi** numerous but small. **Phyllaries** 13–21, green, 6–10 mm, sparsely tomentose proximally, glabrous distally. **Ray florets** 8–10 or occasionally 13, corolla laminae 5–8+ mm. **Disc florets**, 45–60+, corolla tubes 3–3.5 mm, limbs 4–5 mm. **Cypselae** 1.5–2.5 mm long, glabrous or lightly hirtellous on the angles, pappi 5–6 mm long. 2n = 46.

This species can be found in shortgrass prairies or sagebrush scrub habitats, growing in dry gravelly or sandy soils. It is primarily a plant of the central High Plains, but its range extends into the foothills of the Rockies and into some of the high valleys west of the Rocky Mountain Front in Colorado. It tends to grow in clumps with several stems arising from a single taprooted, woody caudex. The only other species in Colorado with which it may be confused is *P. neomexicana* var. *mutabilis*. That relationship is discussed in detail under *P. neomexicana*. *Packera tridenticulata* flowers from late May to early July.

Packera werneriifolia (A. Gray) W.A. Weber & Löve, Phytologia 49:48. 1981. *Senecio werneriaefolius* A. Gray.

Senecio saxosus Klatt; *Senecio petrocallis* Greene; *Senecio scaposus* A. Nelson; *Senecio perennans* A. Nelson; *Senecio muirii* Greenm.; *Senecio molinarius* Greenm.

Perennials. **Caudices** branching, sub-rhizomatous, sometimes several densely crowded and caespitose. **Stems** 7–15+ cm, single or 3–5 clustered, floccose or lanate-tomentose, canescent or occasionally glabrate. **Basal Leaves** sessile or with very short petioles, blades narrowly lanceolate to elliptic, 1.5–4+ × 0.5–2.5 cm, bases tapering, margins entire or dentate toward the apex, frequently revolute; or in some populations petiolate with blades ovate to orbicular, 1–2 × 0.5–1.5 cm, bases tapering to abruptly contracted, margins entire or wavy, occasionally dentate toward the apex. **Cauline leaves** reduced to mere bracts, plant with a scapose aspect. **Heads** radiate, 1–5 or in some populations 3–8. Peduncles inconspicuously bracteolate, glabrous to densely pubescent. **Calyculi** conspicuous, frequently anthocyanic. **Phyllaries** 13 or 21, green or with anthocyanic apices, 4–10 mm, glabrous to pubescent. **Ray florets** 8 or 13, corolla laminae 5–10 mm; or occasionally absent. **Disc florets** 30–50+, corolla tubes 2.5–3.5 mm, limbs 3–4 mm. **Cypselae** 1.5–2 mm long, glabrous, pappi 5–6 mm long. 2n = 44 or 46.

This species grows on rocky talus slopes or in sandy soil in forest openings near or above timberline. Flowering time varies greatly with elevation but is generally from mid-June to mid-August. Some specimens have basal leaf blades that are sessile and very narrow, while the basal leaves of others are petiolate and more ovate in outline. Some specimens are densely tomentose, while others are only lightly pubescent, even glabrate. But the feature that all of the specimens have in common is their scapose aspect.

The only species in Colorado with which it could be confused is *P. cana*, and that relationship is discussed in detail under the comments for *P. cana*.

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